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# Avian Influenza Risk Perceptions, Laos

**To the Editor:** After the 2004 outbreak of highly pathogenic avian influenza (HPAI) in poultry in Lao People's Democratic Republic (PDR), the Ministry of Health implemented extensive virologic surveillance (1,2). Surveillance began in July 2005, and by early 2006, only sporadic cases were found. In July 2006, an outbreak of HPAI was confirmed on 2 chicken farms in Vientiane, the capital city of Lao PDR (1,3). Most of Laos' ≈20 million chickens are kept on family-owned backyard farms; 3.2 million are on commercial farms (4). This production meets 80% of Lao poultry (chicken, duck, goose, quail) needs; imports from neighboring countries, either through legal trade or cross-border smuggling, account for the rest (3). Common poultry diseases occur frequently during the cold season, and lack of reporting of poultry deaths is of concern (4).

Until February 2007, no human cases of influenza A (H5N1) had been reported in Lao PDR. To learn more about Laotians' knowledge of HPAI and perceptions of their risk, we conducted a cross-sectional survey.

In March–April 2006, participants in 3 settings (Vientiane, urban; Oudomxay, semiurban; Attapeu Province and Hinheub District, both rural) were interviewed in the Lao language by means of a standardized 33-question survey. We recorded information about behavior, poultry handling and keeping practices, and poultry deaths. We used multivariate analysis (Stata, version 8; Stata Corporation, College Station, TX, USA) to analyze the factors associated with behavior changes.

Using a random sampling list of visitors and vendors, we interviewed 461 respondents in 4 Vientiane city markets (Vientiane has 114,793 households and 3,700 registered poultry farms) (5). Semiurban respondents were recruited in Oudomxay (40,987 households, 715 poultry farms), an active trading zone near the Chinese border. Rural respondents were recruited from Hinheub District and in Attapeu (19,050 households, 360 poultry farms), near the Vietnam

border. Twenty villages were randomly selected, and 10 participants per village were randomly selected for interview. Approval for the investigation was obtained from the health and market authorities. Oral consent for interview was obtained from participants.

A total of 842 participants were interviewed. Differences in occupation and literacy were associated with different study areas. Differences in participant sex and age were also noted because, in the rural areas, interviews took place in the home. A total of 583 (69.3%) participants were female: 302 (65.5%), 139 (68.2%), and 150 (79.3%), in urban, semiurban, and rural areas, respectively;  $p = 0.002$ , 95% confidence interval 66–72. Mean ages for participants in these areas were 41 (range 40–43), 34 (range 32–36), and 38 (range 37–41) years, respectively;  $p < 0.001$ . Animal breeding was conducted by 50% of families. Daily close exposure to poultry was common (39.6%). Few families owned a henhouse, and no special handling of poultry was reported. Rates of poultry vaccination against common poultry diseases were higher in urban and semiurban areas; veterinary surveillance was low (10.2%).

Overall, 96.9% of respondents had already heard of HPAI, mainly through television. Urban residents ranked it as the most well-known poultry disease, but rural residents ranked it fifth. Less than half of the respondents had some knowledge of the disease signs and symptoms for humans and poultry; 28.4% could describe 1 symptom. Half of the respondents believed that they were not at risk for human avian influenza or that their poultry were not at risk for it. Respondents in urban and semiurban areas knew more about avian influenza than those in rural areas.

During the cold season, poultry deaths were higher in the north (colder) and south than in Vientiane. The poultry mortality rate during the cold season was similar to that of Cambodia (6). Behavior regarding poultry deaths differed between areas. Despite a high rate of poultry deaths, none of the interviewees had notified authorities. Since hearing about HPAI, 67.1% respondents, mainly in Vientiane, claimed that they had changed behavior regarding poultry. Multivariate analysis showed the following factors to be associated with behavior change: level of education ( $p = 0.002$ ), urban living ( $p < 0.001$ ), knowledge of avian influenza risk ( $p < 0.001$ ) and disease ( $p < 0.001$ ), owning poultry ( $p < 0.001$ ), and being a government worker ( $p < 0.001$ ).

This study had limitations but provides new insights on Laotians' knowledge and poultry practices with regard to HPAI. Despite a high level of awareness, populations underestimated the

risk, particularly those in rural areas. Most respondents were unaware of appropriate poultry-handling measures to reduce risk (6). The claimed changes were higher (more frequent and more substantial) in urban (91.8%) than in rural sites (3.8%,  $p < 0.001$ ), higher than changes made by their counterparts in Thailand (7), and confirmed by reports after the 2004 outbreaks (8,9). These differences between urban and rural areas might be explained not only by participant characteristics but also by a lower extent of the awareness campaign in rural areas.

Failure to report poultry deaths should be addressed and has several possible explanations. Farmers are accustomed to common yearly poultry deaths, which are not reported. In the absence of an official compensation statement, farmers may fear income loss from massive poultry culling.

Our results emphasize the need for more accurate information about transmission risks, notification requirements, safer behavior and practices, and compensation for losses. Focus also needs to be placed on building capacity in the veterinary system (10). These issues should be integrated in the Laos National Avian Influenza Control and Pandemic Preparedness Plan (2006–2010).

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Table. Avian influenza knowledge, risk perception, and poultry-keeping behavior, Lao People's Democratic Republic\*

| Characteristic                         | Urban, n (%) | Semiurban, n (%) | Rural, n (%) | Total, n (%) | p       | 95%CI       |
|--|--------------|------------------|--------------|--------------|---------|-------------|
| Total persons interviewed              | 461          | 192              | 189          | 842          |         |             |
| Illiterate                             | 175 (37.9)   | 60 (31.2)        | 181 (95.7)   | 416 (49.4)   | <0.001  | 47.1–54     |
| Occupation                             |              |                  |              |              |         |             |
| Housewife                              | 126 (27.3)   | 24(12.5)         | 94 (50)      | 244 (28.9)   | <0.001  | 32–25.9     |
| Farmer                                 | 25 (5.4)     | 36 (18.75)       | 75 (40)      | 136 (16.1)   | <0.001  | 13.7–18.6   |
| Government worker                      | 103 (22.4)   | 22 (11.5)        | 3 (1.5)      | 128 (15.2)   | <0.001  | 12.8–17.6   |
| None                                   | 2 (4.3)      | 0                | 24 (12.6)    | 36 (4.2)     | <0.001  | 2.9–5.6     |
| Keep poultry                           | 185 (40.2)   | 97(50.5)         | 159 (84.3)   | 441 (59.4)   | <0.001  | 19 (17–20)  |
| ≥1 poultry death, past 2 mo†           | 58 (31.3)    | 84 (86.5)        | 95 (59.7)    | 239 (54.1)   | <0.000  | 49.5–58.8   |
| Any poultry deaths, past 2 y           | 95 (51.3)    | 62 (63.9)        | 141 (88.6)   | 298 (65.5)   | <0.001  | 63.2–71.9   |
| Response to dead poultry (n = 399)‡    |              |                  |              |              |         |             |
| Bury dead chickens                     | 105 (56.7)   | 87 (89.6)        | 118 (74.2)   | 310 (70.2)   | <0.001  | 66–74.6     |
| Throw out dead chickens                | 50 (27.0)    | 5 (5.1)          | 9 (5.6)      | 64 (14.5)    | <0.001  | 11.2–17.8   |
| Eat dead chickens                      | 1 (0.5)      | 2 (2.0)          | 7 (4.4)      | 10 (2.2)     | 0.06    | 0.9–3.7     |
| Treat other chickens                   | 0            | 0                | 5 (2.6)      | 5 (0.5)      | <0.001  | 0.07–1.1    |
| Apply lime to backyard                 | 0            | 8 (1.7)          | 1 (0.5)      | 9 (1.0)      | <0.001  | 0.03–1.7    |
| Sell dead chickens                     | 0            | 1 (1.0)          | 0            | 1 (0.1)      | 0.1     | 0.00–0.3    |
| Report dead chickens                   | 0            | 0                | 0            | 0            | NA      | NA          |
| Poultry location                       |              |                  |              |              |         |             |
| Henhouse                               | 39 (21.0)    | 4 (4.4)          | 7 (4.4)      | 50 (11.3)    | <0.001  | 8.4–14.3    |
| Inside house                           | 8 (4.3)      | 1 (1.03)         | 2 (12.6)     | 11 (2.4)     | 0.003   | 1–3.9       |
| Near house (<5 m)                      | 78 (42.2)    | 59 (61)          | 28 (17.7)    | 165 (37.4)   | <0.001  | 32.9–41.9   |
| Far from house (>5 m)                  | 58 (31.3)    | 30 (31)          | 114 (71.7)   | 202 (45.8)   | <0.001  | 41.2–50.5   |
| Regular poultry vaccination            | 81 (43.7)    | 54 (55.6)        | 19 (11.9)    | 154 (34.2)   | <0.001  | 30.5–39.4   |
| Information source                     |              |                  |              |              |         |             |
| Never heard                            | 8 (1.7)      | 11 (5.1)         | 7 (3.7)      | 26/837 (3.1) | 0.02    | 1.9–4.3     |
| Heard from television                  | 388 (86.4)   | 158 (87.8)       | 178 (97.8)   | 724 (89.2)   | <0.001  | (86.4–90.8) |
| Heard from radio                       | 19 (4.2)     | 12 (6.6)         | 4 (2.2)      | 35 (4.3)     | 0.1     | (3.02–5.9)  |
| Read in paper                          | 6 (1.3)      | 1 (0.5)          | 0            | 7 (0.8)      | 0.003   | (0.34–1.8)  |
| Perceive risk for avian influenza      |              |                  |              |              |         |             |
| In Laos                                | 369 (81.6)   | 110 (60.7)       | 8 (4.3)      | 487 (59.6)   | <0.001  | 56.3–63     |
| At home                                | 293 (64.8)   | 72 (40.0)        | 5 (2.6)      | 370 (45.7)   | <0.001  | 41.9–48.8   |
| Unable to describe human disease       | 116 (25.6)   | 116 (63.7)       | 182 (97.5)   | 414 (50.7)   | <0.001  | 47.3–54.2   |
| Able to describe as lethal for poultry | 306 (67.5)   | 90 (49.7)        | 2(1.0)       | 398 (48.7)   | <0.0001 | 45.3–52.2   |
| Behavior change‡                       | 416 (91.8)   | 125 (69.0)       | 7 (3.8)      | 548 (67.1)   | <0.0001 | 63.9–70.4   |
| Stopped eating chicken                 | 328 (72.4)   | 120 (66.2)       | 0            | 448 (54.9)   | <0.000  | 51.5–58.3   |
| Avoided contact                        | 348 (76.8)   | 60 (33.1)        | 3 (1.6)      | 411 (50.3)   | <0.000  | 46.9–53.8   |
| Stopped keeping poultry                | 335 (73.9)   | 13 (7.1)         | 1 (0.5)      | 349 (42.7)   | <0.000  | 39.4–46.2   |
| Wear mask                              | 338 (74.6)   | 10 (5.5)         | 1 (0.5)      | 349 (42.7)   | <0.000  | 39.4–46.2   |
| Wash hands after contact               | 100 (22.0)   | 3 (1.6)          | 1 (0.5)      | 104 (12.7)   | =0.002  | 10.5–15     |
| Eat well-cooked chicken                | 155 (34.2)   | 3 (1.6)          | 1 (0.5)      | 159 (19.4)   | <0.000  | 16.8–22.2   |

\*CI, confidence interval; NA, not applicable.

†Mean nos. poultry deaths were 15 (range 10–19), 27 (range 22–32), and 15 (range 13–18), for urban, semiurban, and rural areas, respectively. Total mean = 19.3; p<0.0001; 95% CI, 17.0–18.4.

‡95% CIs 89–94, 62–76, 1–7 for urban, semiurban, and rural, respectively.